

creatures develop from eggs." Further comment is needless.

Although published in 1901 and mentioned in the *Zoological Record* for that year, this book has not previously been brought under our notice.

*Second Stage Magnetism and Electricity.* By Dr. R. Wallace Stewart. Second edition. Re-written and enlarged. Pp. viii+416. (London: W. B. Clive.) Price 3s. 6d.

THIS book is primarily intended to serve the purposes of a candidate preparing for the second stage examination under the Board of Education (secondary branch). In reading it, we have by no means made our first acquaintance with Dr. Stewart, and the perusal has left us of our old opinion that, whether regarded as text-books intended to prepare a student for a particular examination or as a source of culture, the books prepared by the author can be very earnestly recommended. He is a lucid and accurate writer. He knows where to draw the line so that an elementary student shall not be repelled by the complication of a subject.

The present volume is brought up to date. The importance of the field—that is, the medium surrounding an electrified conductor or magnet—is insisted on; perhaps even their importance is emphasised too much. The tendency of modern thought amongst physicists is to restore to a conductor part, at any rate, of the position that it held in pre-Maxwellian days. The dielectric plays a most important part—that is a position, won for it by Maxwell, which it can never lose. At the same time, one should not lose sight of the fact that there *must* be some mechanism at the ends of a line of induction, and to-day that mechanism is being studied under the name of *electron*. The electron is an essential part of a conductor, and the complete phenomena of electricity are not fully accounted for without including it.

The volume is almost entirely re-written. It is not surprising, therefore, that there are some unfortunate slips which have escaped the vigilance of the reader. As these are misleading, we will state that on the bottom of p. 33 "positive" and "negative" should be interchanged. The following phrase (p. 42) is very misleading:—"The portions of those walls, which are, as it were, in the shadow of these objects, possess no induced charge." We think that the first thirty pages might be improved in any later edition. Considerable care has evidently been taken; yet in many cases confusion is introduced by the neglect of some tiny detail. Thus, in describing the attraction and repulsion of a pithball with subsequent re-attraction, *if in the interval it comes in contact with an earth-connected body*, the phrase that we have put in italics is omitted; and in several cases where a body is touched to earth it is not explicitly said whether the contact is to be broken before a succeeding operation is performed or not. Why is it "evident" (p. 16) that doubling a charge will double the force it exerts on another charge?

*Memoria sobre el Eclipse Total de Sol del día 30 de Agosto de 1905.* By D. Antonio Tarazona. Pp. 125. (Madrid: Bailly-Baillière E. Hijos, 1904.)

THOSE who are familiar with the Spanish language and have made up their minds to go abroad and see the approaching total eclipse of the sun will find in this book a great amount of useful information relating to this interesting event. The work is issued from the Madrid Astronomical Observatory, the director, Francisco Iñiguez, having contributed a brief preface, and contains full particulars concerning the elements of this eclipse; in fact, it might be considered a treatise on the subject, so complete is the information. In

addition to a great many data which will be of special use to astronomers, there will be found a very full list of towns, in alphabetical order, at which totality occurs, with the times of the different phases of the eclipse. More generally useful perhaps will be found the maps at the end of the volume. These include a map of the world showing the position of the track from the commencement to the end of totality over the earth's surface. A second illustrates on a larger scale the Spanish portion of the track, with special lines showing the times of occurrence and duration of totality. The third, on a much larger scale (1:1,000,000), indicates that part of Spain alone over which the shadow sweeps, and is very complete as regards names of places, railways, &c. Lastly, two star charts are added, one showing the position of the eclipsed sun among the stars, and the second a key map to this chart giving the designations of the stars and planets in this region.

Visitors to Spain will do well to supplement their literature by securing this volume, and thanks are due to the Madrid Observatory for producing so useful a book so far in advance of the event.

*Naturalistische und religiöse Weltansicht.* By Rudolf Otto. Pp. 296. [Tübingen: J. C. B. Mohr (Paul Siebeck), 1904.] Price 3 marks.

NO better book than this could be recommended to the young philosophical or theological student who wishes to obtain a clear and comprehensive view of the debatable ground where science, philosophy, and theology meet. The author is well read, a skilful debater, a vigorous writer; and as handbooks ought not to be unnecessarily multiplied, it is to be hoped that this one will be translated.

Like many other works in defence of religion in general, the book is not so strong on the constructive as on the critical side. The author refers with approval to the attitude of Kant when he solved certain contradictions or antinomies by a reference to the world of things in themselves. As this is precisely the point where Kant's philosophy is most seriously questioned, the argument probably suffers to that extent. But, on the other hand, the author fully realises the unity of the various phases of the one problem religion *versus* naturalism, and the harm which has been done by concentrating the attention on one phase (e.g. the question of miracles) as if it were the whole.

The work is valuable mainly for its survey of the most interesting biological theories of the last century, from Darwin, Hæckel, Weismann, down to Wolff, Korschinsky, Driesch. The philosophical development of this last writer is sketched in an enlightening fashion. With regard to the general theory of development and "descent," the author comes to the conclusion that with the confirmation of any such theory only something relatively external is given, a clue to creation, which does not so much solve its problems as group them afresh. The index at the end of the work gives an explanation of the more difficult terms employed by modern theorists.

*An Introduction to Projective Geometry and its Applications.* By Dr. Arnold Emch. Pp. vii+267. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1905.) Price 10s. 6d.

THIS text-book of modern projective geometry forms an admirable introduction to the subject, and should be known to all who are interested in this branch of mathematics. The first chapter deals with the general properties of projective ranges and pencils and their products; including harmonic and perspective projection, and the projective properties of the circle. Then

follows an investigation of collineation in a plane, comprising perspective transformations, and the linear transformations of translation, rotation, and dilatation, with combinations of these. The intimate relation that exists between projective and descriptive geometry is shown. The third chapter gives the general theory of conics, the projective properties of the circle being extended to conics by perspective transformations. The next chapter deals with pencils and ranges of conics and their products, and especially with cubics, the latter being classified under the five standard types by the help of the Steinerian transformation. Throughout the book analytical and geometrical methods are employed side by side, some portions of the subject being better suited to the former treatment; moreover, the analysis affords excellent illustrations of modern analytical geometry. The main purpose of the author has been to develop the subject in regard to its practical applications in mechanics, and the last chapter is devoted to such examples. Thus we find problems in graphic statics, plane stresses, and in the stress ellipse of an elastic material, and there is an interesting account of various linkages by means of which linear and perspective transformations can be mechanically obtained. The book is excellently got up in every way, and the diagrams are quite perfect and may well serve as models of what such figures ought to be. The author is a very clever draughtsman, and his skill as a writer is equally pronounced.

#### LETTERS TO THE EDITOR.

*[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]*

#### Fictitious Problems in Mathematics.

In my younger days it was well recognised that such statements as "perfectly smooth" and the like were mere conventional phrases for designating an ideal state of matter, which was assumed to exist for the purpose of simplifying the mathematical conditions as far as possible. Nobody can learn mathematics without working out a large number of problems and examples, and in order to make these sufficiently easy for the beginner, various fictitious hypotheses have to be introduced.

Similar objections would apply to the phrase "frictionless liquid"; but it would be impossible for anyone to learn hydrodynamics without first studying the mathematical theory of this fictitious form of matter. In fact, the introduction of viscosity leads to such formidable difficulties, that nobody has yet succeeded in solving such a simple problem as the motion due to a doublet situated at the centre of a sphere; and the solution, if it could be obtained, would throw much light on the mode of attacking more difficult problems. A. B. BASSET.

May 28.

IN NATURE of May 18 the wording of a problem set near the beginning of my "Rigid Dynamics" is rather adversely commented on. In the problem a man is described as walking along a perfectly rough board which rests on a smooth table, and the criticism is that the two suppositions are inconsistent; but this depends on what is meant by the words used, and perhaps I may be allowed to make an explanation.

When bodies are said to be perfectly rough, it is usually meant that they are so rough that the amount of friction necessary to prevent sliding in the given circumstances can certainly be called into play. In art. 156 of the treatise on dynamics, just after the laws of friction have been discussed, the words "perfectly rough" are defined to have this meaning. The board in question has therefore no special peculiarity. All that is stated is that the

coefficient of friction between the man and the board exceeds a certain finite quantity.

The board rests on a smooth table, but the coefficient of friction now depends on both the board and the table, and this may be quite different from that between the man and the board. There is nothing amiss in supposing this coefficient to be zero. One way of effecting this experimentally would be to polish the table and remove all roughnesses from it. This was the plan indicated.

Where, then, is the inconsistency?

By using the ordinary abbreviations of language, the wording of the question has been made concise, and thus attention was specially directed to the dynamical principle involved in the solution.

The problem has been understood by so many students in the sense above described, and worked without a single objection having been raised, that I think the meaning must be perfectly clear. Indeed, I cannot imagine what other meaning it could have. E. J. ROUTH.

May 20.

#### On the Spontaneous Action of Radio-active Bodies on Gelatin Media.

In the course of some experiments on the formation of unstable, molecular aggregates, notably in phosphorescent bodies, I was led to try whether such dynamically unstable groupings could be produced by the action of radium upon certain organic substances. It will scarcely be necessary to enter here into an account of the many speculative experiments which I have at one time or another tried, but it will suffice if I describe, as briefly as possible, the experiment which, amongst others, has led to a very curious result, and that is the effect of radium chloride and radium bromide upon gelatin media, such as those generally used for bacterial cultures.

An extract of meat of 1 lb. of beef to 1 litre of water, together with 1 per cent. of Witter peptone, 1 per cent. of sodium chloride, and 10 per cent. of gold labelled gelatin, was slowly heated in the usual way, sterilised, and then cooled. The gelatin culture medium thus prepared, and commonly known as bouillon, is acted upon by radium salts and some other slightly radio-active bodies in a most remarkable manner.

In one experiment the salt was placed in a small hermetically sealed tube, one end of which was drawn out to a fine point, so that it could be easily broken. This was inserted in a test-tube containing the gelatin medium. The latter was stopped up with cotton wool in the usual way with such experiments, and then sterilised at a temperature of about 130° C. under pressure for about thirty minutes. Controls without radium were also at various times thus similarly sterilised.

When the gelatin had stood for some time and become settled, the fine end of the tube containing the radium salt was broken, from outside, without opening the test-tube, by means of a wire hook in a side tube.

The salt, which in this particular experiment consisted of 2½ milligrams of radium bromide, was thus allowed to drop upon the surface of the gelatin.

After twenty-four hours or so in the case of the bromide, and about three or four days in that of the chloride, a peculiar culture-like growth appeared on the surface, and gradually made its way downwards, until after a fortnight, in some cases, it had grown fully a centimetre beneath the surface.

If the medium was sterilised several times before the radium was dropped on it, so that its colour was altered, probably by the inversion of the sugar, the growth was greatly retarded, and was confined chiefly to the surface.

It was found that plane polarised light, when transmitted through the tube at right angles to its axis, was rotated left-handedly in that part of the gelatin containing the growth, and in that part alone.

The controls showed no contamination whatever, and no rotation. The test-tubes were opened and microscopic slides examined under a twelfth power. They presented the appearance shown in Fig. 1. At first sight these seemed to be microbes, but as they did not give subcultures when inoculated in fresh media they could scarcely be bacteria. The progress of any of the subcultures after a month was extremely small, and certainly